ENVIRONMENTAL ASSESSMENT

OF THE

OPERATION AND MAINTENANCE

OF

OTTER BROOK LAKE

OTTER BROOK

KEENE AND ROXBURY, NEW HAMPSHIRE

Prepared by

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

OCTOBER 1973

Preface

The purpose of this Environmental Assessment is to provide the basis for evaluation of the environmental impact on the project area due to the routine operation and maintenance of this flood control reservoir. Otter Brook Lake has been operated whenever necessary since it was constructed to prevent or reduce downstream flooding. Maintenance and management of the project, including the recreation facilities, during non-flood periods is also of primary importance. Enhancement of the fish and wildlife resources as well as protection of the environment within and around the reservoir area has been given careful consideration.

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I. PROJECT DESCRIPTION

A. Introduction

Otter Brook Lake is located in the Monadnock region of southern New Hampshire between the city of Keene and the town of Roxbury in Cheshire County. Authorization for the project comes from the Flood Control Act of 3 September 1954 (Public Law 780, 83rd Congress) and the Flood Control Compact adopted by the States of Connecticut, Massachusetts, Vermont and New Hampshire in 1963. The dam and reservoir, completed in 1958, provide flood protection for the community of Keene, and secondarily, help reduce flood stages at other downstream communities on the Ashuelot and Connecticut Rivers. The project comprises about 458 acres of which 85 are water.

Otter Brook Dam is operated in conjunction with the Surry Mountain Flood-Control Project which is located north of the city of Keene on the Ashuelot River.

B. Structures

1) Dam: The dam is a rolled earth filled structure, 1,288 feet long with a maximum height of 133 feet above the stream-bed. The top width of the dam is 25 feet and accommodates an 18 foot wide paved access road. The embankment consists of compacted earth with rock slope protection. The top of the dam at elevation 802.0 feet msl provides 17.3 feet of spillway surcharge and 3.7 feet of freeboard.

2) Spillway: The spillway is located in a rock cut at the west abutment. The uncontrolled overflow concrete ogee weir is 145 feet long and has its crest at elevation 781 feet msl which is five feet above the approach channel. The chute has a width of 142 feet at the spillway apron and narrows uniformly to a width of 60 feet in its 600-foot length. The spillway is separated from the dam by a rock spur, which rises above the top of the dam.

3) Outlet Works: These consist of a gate chamber, control tower and operating house on the upstream side of the dam. A six-foot diameter Boston Horseshoe discharge tunnel passes through the foundation and empties into Otter Brook at the downstream toe of the dam. The gate structure contains three 2'6" x 4'6" hydraulically operated vertical slide gates used for regulation purposes. The inlet elevation is 683.0 feet msl.

4) Water Storage: A concrete weir provided at the entrance to the center gate maintains a permanent recreational pool at elevation 701 feet msl which extends about one mile upstream and inundates 85 acres. The shoreline of the pool is about 2.4 miles in length. Its gradually sloping shore at the upper end becomes steeper towards the dam. Total net storage of the recreation pool is 720 acre-feet.

The recreation pool is maintained at a state of 18 feet by the control weir during the non-freezing season. During the freezing season, pool storage is maintained at about 20 feet with the weir submerged.

The amount of flood control storage in the reservoir between elevations 701 and 781, which is the spillway crest elevation, is equivalent to 17,600 acre feet or 7.0 inches of runoff.

C. Operation Procedures

Reservoir regulation management and operation functions are performed by the Reservoir Control Center (RCC), which is part of the Water Control Branch of the Engineering Division. Members of the Hydrologic Engineering, Hydraulics, and Water Quality Sections of the Water Control Branch assist the RCC during routine and flood operations and provide technical assistance to the Center as required. The RCC which consists of a staff of hydrologic engineers is subdivided into basin units, each responsible for receiving hydrometeorological reports and directing reservoir regulations within the basin. Each unit consists of a regulator in charge of the overall operation of the basin and project regulators who receive reports and issue instructions to individual dams.

The dam operator makes weekly radio reports to the RCC concerning local conditions in the area and at the project itself. The report includes pertinent information such as precipitation, meteorological conditions, reservoir pool stage, regulation data, etc.

Alert reports are made immediately for any of the following conditions:

1) One (1) inch of precipitation during a 24-hour period at the dam or at any precipitation station within the watershed;

2) A reservoir stage of 21 feet and rising during the non-freezing season;

3) A reservoir stage of 24 feet and rising during the freezing season;

4) Whenever the Ashuelot River at the Keene telemark rises to an elevation of 468 feet and is rising;

5) Unusual conditions such as difficulty with gates, ice jams, excessive debris, bridge failure, etc.

During the non-freezing season, the recreation pool is maintained at a stage of about 18 feet by the control weir and stoplogs located immediately upstream of the center flood control gate. The two outside gates are closed and the center gate remains fully open. The gates stay in this position until the pool reaches a stage of 21 feet, at which time the RCC is notified.

During the freezing season, the weir is submerged with the pool stage maintained at about 20 feet. The center gate and one outside gate are closed with the other outside gates kept partially opened. If the pool

reaches a stage of 24 feet, the RCC is notified. In the springtime RCC notifies the dam operator when to lower the winter pool.

During flood periods regulation occurs in three phases: 1) appraisal of storm and river conditions during development of the flood leading to the initial regulation procedures; 2) regulation of discharge while the Ashuelot River and the Connecticut River flood flows crest and move downstream; 3) emptying the reservoir following the downstream recession of the flood. Regulation of the reservoir is coordinated with the other flood control projects in the Connecticut River Basin to facilitate optimum effectiveness of the entire system.

Following the recession of the flood peaks at downstream index stations on the Ashuelot River, the reservoir will be emptied as rapidly as possible in accordance with instructions from the RCC. Except under unusual flood conditions, the release shall not exceed a flow of 600 cfs.

Emergency operating procedures (EOP) are available in the event that the dam operator is unable to communicate with the RCC by normal or emergency methods, or in the event of extraordinary flood conditions.

D. Management and Maintenance Programs

The Otter Brook Project is operated and regulated by the Department of the Army, Corps of Engineers, New England Division, Reservoir Control

Center. No other Federal, State, County, or private agencies have any responsibility in the regulation of this reservoir.

Recreation facilities are operated by the State of New Hampshire, Department of Resources and Economic Development, Division of Parks, under a 25-year lease (signed in 1964) which covers approximately 350 acres of land. This agency is responsible for coordinating management of the recreation, fish and wildlife and forestry programs of the reservoir.

The recreation facilities consist of the following:

1) Overlook Area, located near the dam, consists of a viewing area and parking facilities. Rest rooms are located at the project headquarters. This area is managed by the Corps.

2) Winter Use Area, located southeast of the dam, is used during the winter for skiing and snowmobiling. This area is managed by the Corps.

3) Day-Use Area, located at the north end of the pool, consists of 80 picnic tables, 26 fireplaces, two boat ramps (one located at the northeastern edge of the pool, and the other at the end of Old Branch Road), parking area for 480 cars, pit latrines, change house and beach. This area is managed by the State of New Hampshire, which charges a 50¢ per person entrance fee.

II. ENVIRONMENTAL SETTING

A. Description of General Area

1) Watershed: The Ashuelot River watershed is located in the southwest corner of New Hampshire in Sullivan and Cheshire counties with a small section in north-central Massachusetts. The watershed is diamond-shaped with a length of 42 miles and a width of 17 miles. The drainage area at the confluence of the Ashuelot and Connecticut Rivers is 421 square miles. Otter Brook is approximately 14 miles in length and has a total drainage area of 54.5 square miles, of which 47 square miles lie above the project. The stream is moderately fast flowing and averages about 35 feet in width. The mean depth varies seasonally, with depths of 12 - 18 inches during the winter. For the most part the stream-bed is composed of sand, gravel, and cobble.

The topography of the area is hilly with moderate relief. In the reservoir area, the valley is steep-sided and narrow which is conducive to rapid run-off. The floor is about 300 feet wide at the dam and about 1200 feet wide at the upstream limit of the permanent pool. The hills on the east side reach an elevation of 1400 feet msl.

2) Climate and Rainfall: The climate is variable, characterized by short and frequent periods of heavy precipitation. The mean annual temperature is 45° F, varying from means near 70° F in

July and 20° F in January. Freezing temperatures can be expected to occur from late September through early May. Extreme temperatures of record are -32° and 104° F. The mean annual precipitation over the watershed is approximately 40 inches, distributed uniformly throughout the year. Monthly records at Keene vary from a maximum of 11.09 inches in July to a minimum of 0.20 inches in September. The mean annual snowfall at Keene is 63.3 inches with 52 percent occurring in January and February. Water content of the snow cover reaches a maximum about the middle of March and has averaged approximately 5.2 inches, with a range from 1.0 to 9.4 inches. The mean annual run-off represents about 52 percent of the mean annual precipitation. About 54 percent of the run-off occurs in the months of March, April and May. The majority of run-off is associated with rainfall as opposed to snowmelt.

3) Water Quality: Most of the Ashuelot River north of Winchester and all of its tributaries are designated as Class B by the New Hampshire Water Supply and Pollution Control Commission. From Winchester to its confluence with the Connecticut River the Ashuelot River is Class C. Otter Brook and its tributaries are designated (1961) as Class B.

Class B waters, according to State Water Quality Standards, shall have no objectionable physical characteristics, shall be near saturation for dissolved oxygen (not less than 75%), and shall contain not more than 240 coliform bacteria per one hundred milliliters. There shall be no disposal of sewage or wastes into Class B waters without adequate treatment. The pH range shall be

6.5 to 8.0 except when due to natural causes. Any stream temperature increase associated with waste discharge shall not impair any usages specifically assigned to B-class waters.

In general the waters upstream of the project are of high quality. Results of a water-quality monitoring program conducted by the Army Corps of Engineers from 1970 - 1972 revealed that mean annual temperature and turbidity readings have been higher at the impoundment and discharge stations than at the inflow. The higher turbidity levels in the pool may have resulted from swimming activity.

Data is available from a water-quality sampling program conducted by the New Hampshire Water Supply and Pollution Control Commission from 1948 - 1970 at three stations on Otter Brook. It can be observed that all stations have shown relatively stable dissolved oxygen, temperature, and pH readings throughout the sampling period; while total coliform counts varied considerably. Two stations in recent years have experienced significant declines in coliform bacteria counts; one station has shown significant increases.

4) Soils: The land around Otter Brook Lake does not have a modern soil survey. The existing survey was completed in 1937. Marlow loam, steep phase, (over 20% slope) is situated on the embankment. This soil is characterized by rapid run-off and yet is relatively well drained and aerated. This land should remain timbered because it erodes rapidly once vegetation is removed.

Brookfield rough stony series is located in the northeast area of the project. This soil is found on gently rolling hills and contains fairly large boulders. Water percolates readily throughout the soil but run-off can be rapid during hard rains. Most of this land is forested and should have plant cover at all times as it can erode readily during hard rains, and during dry weather wind erosion can be severe. Both Marlow and Brookfield are soils of the uplands and occur over glacial till material. Podunk-Rumney soil lies to the west of the pool. This soil is of medium texture. Podunk soil is imperfectly drained, and Rumney soil is poorly drained. Ondawa fine sandy loam, high bottom phase, is found northwest of the pool. This soil is porous and consequently well drained. Both Podunk and Ondawa are derived from recently deposited alluvium along streams.

5) Vegetative Cover Types: Approximately 73 percent of the land area on the project is forested. The forests consist of mixed hard and softwoods characteristic of the white pine-hemlock-hardwood region of southern New Hampshire. The principal softwoods include white pine and hemlock; the principal hardwoods are northern red oak, black oak, and hickory, while on higher elevations yellow birch, beech, sugar maple, and black cherry may be found. Along the river, elm, black ash, red maple, alder and aspen are the dominant trees. There are no forestry programs on the project. In the past, red pine and tamarack were planted on slopes of the borrow area and in conjunction with a good grass cover have been of benefit in holding the soil in place.

6) Fish and Wildlife: The State of New Hampshire Fish and Game Department stocks trout in Otter Brook on an annual basis. Brook trout are the primary species stocked. The lake is classified as a warm-water fishery and contains populations of horned pout, chain pickerel, yellow perch, and various species of sunfish. There are no records of largemouth bass stocking in the pool.

Otter Brook is considered a good trout stream and is subjected to good fishing pressure. State Fishery biologists indicate that the reservoir would be considered for stocking of largemouth bass if there was enough demand for a warm-water fishery. Project personnel felt that there would be sufficient utilization by local fishermen should such a program be initiated.

The area is inhabited by grouse, woodcock, cottontail, and snowshoe hare, although populations are not large. Deer are found in the vicinity in moderate numbers. It is believed that the population has substantially declined due to severe winter weather from 1968 - 1972.

Fur-bearing species which may be present in the Otter Brook area include fisher, mink, raccoon, fox, beaver, and muskrat. Since low numbers of these species inhabit the project area, trapping activity is minimal.

There are no marsh areas bordering on the pool and thus there is little potential for waterfowl production.

7) Socio-economic Conditions: This area is located within day-use distances of many of the heavily populated cities in Massachusetts, Rhode Island and Connecticut. The project is readily accessible to all sections of the region, over a network of roads and interstate highways. The Connecticut River Valley is the centerpiece of a panorama which includes the Green Mountain Range of Vermont and the White Mountain Range of New Hampshire. National Forests have been established in both ranges. Lake Champlain and Lake George in the westerly part of the region and Lake Winnipesaukee and Lake Sunapee in the easterly part of the region are major attractions.

The economy of the Ashuelot River Basin is stable and highly industrialized. The city of Keene, with a population of 20,000 persons (1970 census) comprises almost one-half of the population in the watershed. There are over forty manufacturing companies which produce ball bearings, tools, furniture, shoes, textiles, optical goods, toys, jewelry, machinery and other manufactured products.

Outside of the central city of Keene, the watershed is sparsely populated and more noticeably rural in nature. Because of heavy forests and hilly terrain, agricultural production has been minimal. As in the case of the rest of New England, the area has experienced a decline in the number of operating farms and acreage under cultivation. Most agricultural activity is devoted to dairy farming and apple production.

B. Water Uses

The principal uses of the lake are for recreational activities which include primarily, swimming and fishing.

Storage capabilities of the reservoir could provide water sources to farmers and municipalities during periods of critical shortages. A study was conducted by Corps personnel to determine the feasibility of using the storage capabilities of this project for low-flow augmentation of the Ashuelot River below Keene during summer months.

C. Related Corps of Engineers Projects

Surry Mountain Lake, located about five miles north of Keene and Otter Brook Lake, located about eight miles northeast of Keene, serve approximately the same region. A common zone of influence has been established which covers a radius of 40 miles, centered midway between the two lakes.

III. THE ENVIRONMENTAL IMPACT OF THE OPERATION, MAINTENANCE AND MANAGEMENT PROGRAM

A. Operation of Project

1) Downstream Effects

a) Flooding Prevented: The Keene flood plain is the most predominant feature of the Ashuelot River Watershed. The meandering river channel has a low discharge capacity with the result that flood-waters cause considerable depth of pondage in the plain. The watershed responds quickly to periods of intense rainfall which can occur in any month. A recurrence of the record flood of September 1938 would cause downstream losses of $8,856,000 (1971 price level). The operation of Otter Brook and Surry Mountain Reservoirs would reduce these losses by $5,809,000. Otter Brook has prevented an estimated $1,922,000 in damages to downstream properties through 1972. Benefits of flood control are also provided to fish and wildlife species by reducing damage to downstream habitat.

b) Water Quality: During 1970, 1971, and 1972 water-quality surveys were conducted by Corps personnel at mid-depth and width of an inflow and discharge station at the Otter Brook site. An impoundment station was also sampled at the edge of the permanent pool at a depth of approximately one foot. Monthly sampling was conducted to measure water temperature, pH, conductivity, turbidity and dissolved oxygen. An additional water-quality survey was conducted to measure a number of biological and chemical parameters.

Sampling for 1970 was limited to one survey conducted at the impoundment station. During this survey, the minimum value for dissolved oxygen was 2.8 ppm which was the lowest value recorded during the three-year period. In 1971 differences in quality between inflow and discharge stations were not significant although there was a slight trend toward higher temperatures at the latter. The impoundment station showed higher mean temperature and turbidity readings for July than did the inflow and discharge stations. These higher readings may be related to location of the station in the littoral zone. In this area water temperatures are likely to be greater and it is possible for sediments to be stirred up during sampling. Data for 1972 showed slight increases in turbidity at the discharge station and lower yearly mean dissolved oxygen concentration than at the inflow station. Higher temperatures were also noted at the discharge station with a peak monthly mean Δt of 6.5° occurring during July.

Additional water-quality parameters were restricted to the impoundment station in 1970. Results showed a mean total coliform count of 100 per 100 ml and a relatively high iron concentration of 3.9 ppm. No impoundment or inflow data was collected in 1971. Discharge data indicate no significant water-quality problems. Available impoundment and discharge data for 1972 also show no water-quality problems.

2) Upstream Effects

a) Vegetative Cover and Timber: Trees in the flood pool area are periodically inundated. Review of the records dating back to 1960 indicate that major flood control operations occur primarily in April with waters retained for an average of 15 days. Flood pools are also sustained during March and May for an average period of 7 days. Occasionally fall storms have resulted in operations during September and October, and sometimes small increases in pool depths occurred during December. Examination of the area revealed no tree or vegetation mortality zones which could be attributed to flooding. The time of flooding usually occurs during the dormant season with the result that trees suffer little or no injury. There is potential for vegetative mortality if and when significant amounts of water are retained during the growing season.

b) Fish and Wildlife: While periodic flooding may cause some mortality to certain fur-bearing species and upland birds and mammals (especially if it occurs during the breeding season), due to the limited size of the project it is felt that the overall effects on populations in the area at large are negligible. The reservoir has minimal effects on the area's big game resources. There are no deer wintering areas on the project.

Much of the embankment around the project area is rock ledge and as such is not conducive to slumping during flood-control operations.

The lake offers minimal waterfowl management potential due to lack of breeding habitat. The pool, however, could be utilized as a stop-over point for migrating waterfowl.

The project has created a warm-water fishery, although the potential for this resource is limited because of water-level fluctuations which usually occur during the breeding season. Maintenance of a viable fishery may require periodic restocking to perpetuate populations especially if fishing pressure becomes severe.

c) Recreational Use: The recreational facilities at Otter Brook Lake present a number of management problems. Personnel from the New Hampshire Department of Parks provided the following inputs regarding operation of the state park.

1) Large amounts of debris are deposited at the site (around picnic area, on the beach and in the change house) following inundation in the spring from flood control operations.

2) Beach sand washes away and becomes mixed with silt and mud as a result of impoundment of flood waters.

3) Pit toilets must be pumped out and deodorized periodically and at the end of the recreation season prior to being inundated during flood control operations.

4) Wash water is not available in the change house because of the design of the water-supply system which was deemed a probable health hazard (The original supply system consisted of a gasoline-powered pump which was used to transport water from the beach area, heavily used by swimmers, to an open tank in the change house.).

B. Construction and Maintenance of Project Facilities

Plant control programs are concerned primarily with weed control on the surface of the dam and the spillway. This is accomplished with the following herbicides.

Herbicide	Control	Rate of Application*
2, 4-D Banvil	broadleaf & brush	3 quarts Banvil & 1 gallon 2, 4-D per 200 gallons water/acre
Dalapon	grass	25 pounds/100 gallons water per acre
Simazine	all species	50 pounds (granular) per acre

*manufacturer's suggested application rate.

Liquid herbicides are applied with a 300-gallon power sprayer to individual plants. Simazine granular is applied with a hand cranked spreader to the spillway.

While it would be difficult to assess the total environmental effects of the plant control program, it is probable that adverse impacts are minimal, if any.

C. Management of Project Lands

1) Recreational Use and Management: Annual attendance at Otter Brook Flood Control Project from 1962 - 1972 is presented in the following table. In general, annual attendance increased from 1962 to 1964. Thereafter a decline was noted (1965) due primarily to the initiation of user fees by the State of New Hampshire. No explanations can be offered for the increases and decreases that are evident.

There has not been a substantial amount of hunting activity at this project. Sightseeing, while undergoing a decrease from high

ANNUAL ATTENDANCE AT OTTER BROOK RESERVOIR FROM 1962 - 1972

LOCATION	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Vicinity of Dam	20,000	36,839	42,972	45,512	44,555	42,651	35,250	42,625	36,424	42,500	58,850
State Park Area*	28,000	21,204	46,767	34,228	3,518 (3,963)	8,288	11,987	13,938 (14,080)	13,065 (13,147)	7,620 (8,181)	7,068 (7,102)
TOTAL	48,000	58,043	89,739	76,740	48,073	50,939	47,237	56,563	49,489	50,120	65,918

* ( ) indicates State of New Hampshire statistics.

numbers recorded in 1964 and 1965, has remained fairly stable over the last seven years. Skiing has declined during recent years due to the fact that Keene State Teachers College no longer holds ski classes at the project area. Fishing has remained fairly stable since 1966. Most of the fishing activity in the area occurs on the tributaries and on Otter Brook above and below the project. Fishing in the pool itself is minimal with the exception of ice-fishing in the winter, primarily because of the establishment of entrance fees and restrictions on the use of outboard motors. Boating underwent a significant decline in 1966 for the same reasons and has remained low up to the present. Swimming and picnicking both follow the same basic trends. Decreases in these activities were noted in 1965 and 1966 as a result of the charging of user fees. In general, decreases in boating, picnicking, and swimming at Otter Brook in recent years, correspond to increases in these same activities at Surry Mountain Lake which has more picnic facilities, a better beach and no user fees or boating restrictions.

While snowmobiling increased at Otter Brook from 1971 (50) to 1972 (200), it is not a significant activity primarily because the project area is hilly and contains substantial amounts of rock ledges covered with trees and brush. This terrain is not conducive for the construction of snowmobile trails. Most snowmobiling occurs on the roads and open areas near the picnic area at the north end of the project.

IV. ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

A. Fish and Wildlife

There are certain basic problems associated with fish and game management in a flood-control reservoir because of water level fluctuations which at times can be quite severe. In addition, the period of maximum water-level instability occurs during the spring which may coincide with the reproductive season of various fish and wildlife species. Spawning of several species of fish could be severely inhibited by high waters. Periodic flooding can also cause some mortality for certain upland species of birds and mammals which inhabit the area, especially those that reside in close proximity to the pool.

B. Timber and Vegetative Cover

There is an ever-present possibility of mortality to trees, shrubs and other vegetation if back-up of water occurs especially after the growing season begins. Most trees suffer no adverse effects from short-term flooding during the dormant season, but nearly all may be readily killed if flooded for long once active growth begins. Trees which are entirely inundated are often killed and thus seedlings and younger trees are more apt to be damaged than mature trees. Most hardwood species will not survive floodings beyond two to three weeks during the growing season. In general, conifers are more adversely affected by flooding than deciduous trees. However, there have been no significant problems to date.

V. ALTERNATIVES TO THE O&M PROGRAM

Fishery Management

Project personnel indicate that area residents have sufficient interest in sport fishing and that development of a bass fishery would result in an increase in this activity at the reservoir. Although natural lakes abound in this area, the majority of their shorelines are developed with private vacation cottages and suitable public access is not available. It may be worthwhile to undertake a study to determine the feasibility of establishing largemouth bass in the reservoir. A stocking program should include follow-up studies to determine survival and growth rates of the bass. Since water-level fluctuations may interfere or inhibit natural reproduction, periodic re-stocking may be required to maintain populations, especially if fishing pressure becomes severe.

Obtaining an adequate harvest is important for effective management of the fishery resources. Opening and closing the recreational facilities at set hours interferes with early morning and late evening fishing, unless an auxiliary boat ramp is available elsewhere. Providing unrestricted access is a prime consideration before the State of New Hampshire will initiate fishery-improvement programs.

It is believed that charging of fees in combination with restrictions on the use of outboard motors have contributed to low fishing pressure on the reservoir. It may be desirable to separate day-use recreation from fishing activities. Biologists from the Bureau of Sport Fisheries and Wildlife indicated that construction of an additional boat access may be needed and that use of electric motors on the reservoir should be considered. Both of these recommendations would help provide adequate fishing harvest.

Recreational Management

It is desirable from a health and environmental standpoint to improve the sanitary facilities at the project. At any time, emergency flood control operations may be required before the pit toilets could be cleaned out and disinfected and this could result in water contamination. Installing flush toilets with septic tanks and leach fields would reduce this undesirable situation.

For development of future recreational programs it is desirable to have reliable statistics regarding past and current recreational activities. Knowledge of who uses the projects, where they come from, and what types of activities they engage in are basic requirements. Project personnel have only minimal time in which to make counts and estimates of numbers per activity. While accurate statistics are needed, it is evident that collection of this information is time consuming and presents increased demands on already heavy workloads.

Water-Quality Monitoring Program

The following might be considered in order to improve the existing water-quality monitoring program.

1) Samples for many water-quality parameters are taken on an irregular basis. To facilitate limnological and pollutional evaluations, all parameters should be measured on the same dates and at each of the stations.

2) The impoundment station, presently sampled in the littoral zone, should be situated at the center of the pool and a surface-to-bottom profile measuring such parameters as temperature, dissolved oxygen and turbidity should be taken.

3) It is desirable that Corps personnel coordinate the monitoring program with the New Hampshire Water Supply and Pollution Control Commission to determine what parameters should be monitored due to conditions existing in the watershed.

VI. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Operation of the Otter Brook Flood Control Project has provided socio-economic effects to the immediate area and adjacent lands as well as to remote downstream regions. Flood protection provided by the dam insures the continued use of downstream areas by commercial, industrial, and private interests.

Water storage capabilities of the pool provide a potential water-supply to immediate as well as more remote areas which could be utilized during periods of drought or for other emergency needs.

Otter Brook Lake provides greater diversification of recreational facilities, aesthetics, and fish and wildlife habitat. Resource and project management programs increase the educational opportunities of the area. Careful management on a multiple-use basis will protect and preserve these resources for use and enjoyment of both present and future generations.

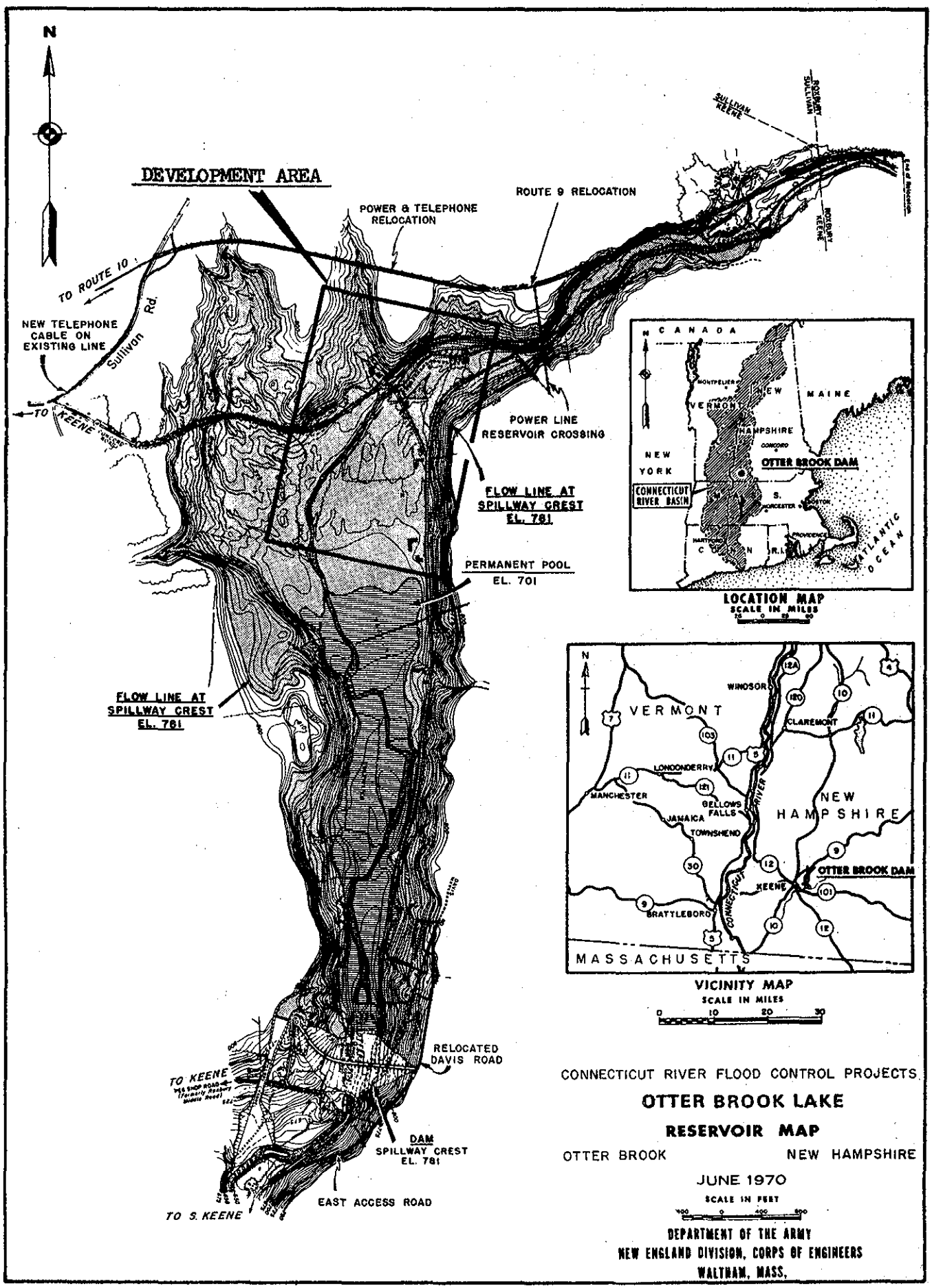
VII. ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE OPERATION AND MANAGEMENT PROGRAM

Extended flooding of the reservoir after initiation of the growing season can cause a certain amount of tree mortality and terrestrial habitat loss. Losses to wildlife and birds during the breeding season can also occur. These losses are neither irreversible nor irretrievable. This situation must in turn be balanced with the environmental disruption to downstream habitat and wildlife which would occur as a result of scouring floods.

VIII. COORDINATION WITH OTHER AGENCIES

The preparation of this Environmental Assessment was coordinated with several Federal, State and Local interests including:

The Bureau of Sport Fisheries and Wildlife
The N.H. Department of Resources and Economic Development
The N.H. Fish and Game Department
The N.H. Water Supply and Pollution Control Commission
The City of Keene, N.H.



CONNECTICUT RIVER FLOOD CONTROL PROJECTS

OTTER BROOK LAKE

RESERVOIR MAP

OTTER BROOK NEW HAMPSHIRE

JUNE 1970

SCALE IN FEET

400 0 400 800

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